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Fish Stocking Assessment of Lost Lake, 2002

R. J. Zemlak and D. M. Cowie
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PWFWCP Report No. 269

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The Peace/Williston Fish & Wildlife Compensation Program is a cooperative venture of BC Hydro and the provincial fish and wildlife management agencies, supported by funding from BC Hydro. The Program was established to enhance and protect fish and wildlife resources affected by the construction of the W.A.C. Bennett and Peace Canyon dams on the Peace River, and the subsequent creation of the Williston and Dinosaur Reservoirs.

Peace/Williston Fish and Wildlife Compensation Program, 1011 Fourth Ave. 3rd Floor, Prince George B.C. V2L 3H9

Website: *www.bchydro.bc.ca/environment/initiatives/pwcp/*

This report has been approved by the Peace/Williston Fish and Wildlife Compensation Program Fish Technical Committee.

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Author(s): Randy J. Zemlak[1] and Dawn M. Cowie[1]
Address(es): [1] Peace/Williston Fish and Wildlife Compensation Program, 1011 Fourth Ave., 3rd Floor, Prince George, B.C. V2L 3H9

LOST LAKE

WATERSHED:	Parsnip River
DATE OF SURVEY:	September 4 - 5, 2002
FIELD CREW LEADER:	Randy J. Zemlak
FIELD ASSISSTANT:	Arne R. Langston

PEACE/WILLISTON FISH AND WILDLIFE COMPENSATION PROGRAM

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GENERATION

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MINISTRY OF WATER, LAND and AIR PROTECTION
ENVIRONMENTAL STEWARDSHIP DIVISION

REPORT PREPARED BY: Randy J. Zemlak
Dawn M. Cowie

INTRODUCTION

Lost Lake is located 2.5 km Southeast of Mackenzie BC (Table 1, Figure 1). The lake has received significant attention since 1993 from fish biologists with both the Ministry of Water, Land and Air Protection (MWLAP) and the Peace/Williston Fish and Wildlife Compensation Program (PWFWCP).

PWFWCP fish biologists conducted a standard fisheries baseline reconnaissance level survey of Lost Lake in June 1993 (McLean 1993). At that time, the lake was believed to be barren of all fish species. No fish were captured in one gill net set and two Gee traps set over night. A proposal to create a recreational fishery in Lost Lake was then put forth. Eastern brook trout was the proposed species for stocking. The application was approved and the lake was first stocked in 1995.

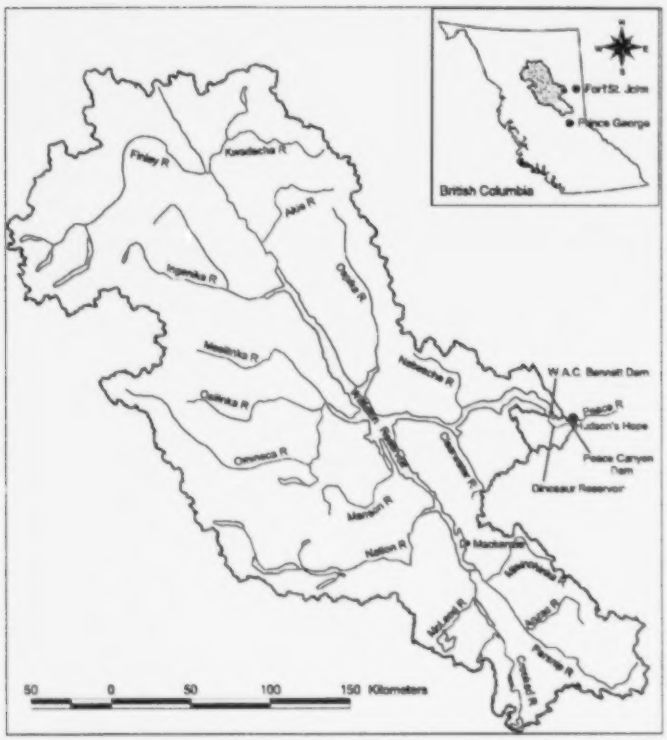
During September 2002, PWFWCP fish biologists re-investigated Lost Lake primarily to evaluate the success of the current fish stocking program and to see if any changes were required. Future stocking recommendations from this evaluation would be passed on to the MWLAP for their approval/implementation.

Table 1. Lost Lake location and information.

Location:	2.5 km southeast of Mackenzie BC
Elevation:	± 716m
Latitude/Longitude:	55° 19' 47" : 123° 02' 55"
U.T.M.:	10.4969.61313 (NAD 1983)
Management Unit:	7-30
N.T.S. Map No.:	93 - O/6, edition 2
Watershed:	Parsnip River
Waterbody Identifier:	00876PARA
Lake Drainage:	internal (closed system)

ACCESS

Although access to Lost Lake has not changed significantly since the original reconnaissance level lake inventory (1993), exact road directions and conditions may have changed over time. From the town of Mackenzie at the intersection of Mackenzie Blvd and Centennial Drive, drive east on Centennial Drive for 1.4 km (paved road). Turn left (towards Morfee Lake) and drive 0.5 km (paved road). Turn right at the baseball diamond road and travel 1.8 km from the gate to Lost Lake (4-wd road). Lost Lake is approximately 30 m from the road on the right hand side. A trail is present for a car top boat. There is no direct vehicle access to the lake shore to launch a boat and trailer.



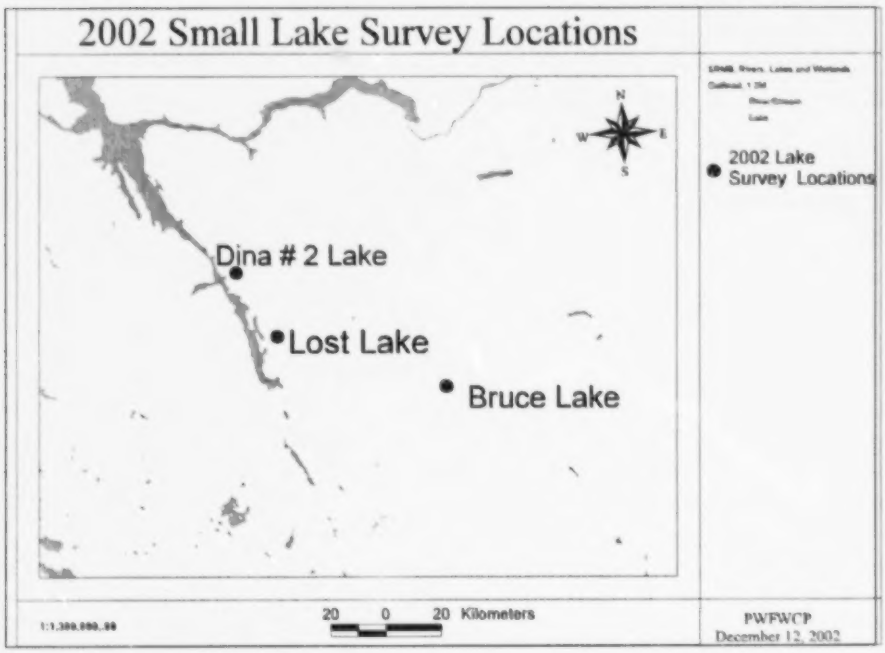


Figure 1. Location of Lost Lake.

STOCKING HISTORY

Lost Lake was initially stocked with 2,500 brook trout in 1995 (Table 2). Brook trout are not native to the Williston Watershed and stocking these fish is restricted to closed systems. One of the reasons for this restriction is to limit the possibility of brook trout spawning with bull trout and producing a sterile hybrid. Bull trout are present in many systems in the Watershed. Therefore, these non-native species can only be introduced to a closed lake system (no outlet).

According to the Release Records Database (MWLAP), brook trout are the only introduced fish species to be stocked in Lost Lake. Initially these brook trout were viable fish but then the stock was changed to sterile fish in 1999. An average of 2,500 brook trout have been stocked four times during the last eight years. The average size of these fish has been 4.9 g.

Table 2. Lost Lake brook trout stocking history.

Year	Species	Number	Size (g)	Life Stage	Stock
1995	EB	2 500	3.8	Fingerling	Aylmer
1997	EB	2 500	3.3	Fingerling	Aylmer
1999	EB	2 500	5.9	Fingerling	Aylmer AF 3N
2001	EB	2 501	6.6	Fingerling	Aylmer AF 3N

METHODS

Four different techniques were used to determine relative abundance of fish species in Lost Lake (Figure 2). Conversations with MWLAP fish biologists prior to the fish capture attempts suggested that it would be valuable to have at least 10 fish sampled from each age group to accurately provide future recommendations to the stocking program. Therefore, about 20 to 30 fish would provide enough data to understand the population structure in Lost Lake.

The first method used was a sinking monofilament experimental gill net set overnight. The net consisted of six different sized mesh panels ranging from 25 to 85 mm. Each panel is 15.24 m long and 2.4 m wide. As standard practise, the gill net was set in the same location as the 1993 survey to compare the catches between years (although no fish were present in 1993).

A second method used was Gee traps. Each Gee trap (three in total) was baited with cat food. The traps were set overnight in shallow (< 2 m) littoral habitat. The intent of these traps was to try and capture juvenile sized fish that are too small to be captured by the gill nets.

The third technique used to capture fish was angling gear. A spin cast rod with an assortment of lures and a trolling fly rod with dry flies were utilised. Any anglers encountered were interviewed to determine their catch per unit effort (C.P.U.E.). Angling efforts by PWFWCP fish biologists were also recorded to determine additional catch per unit effort.

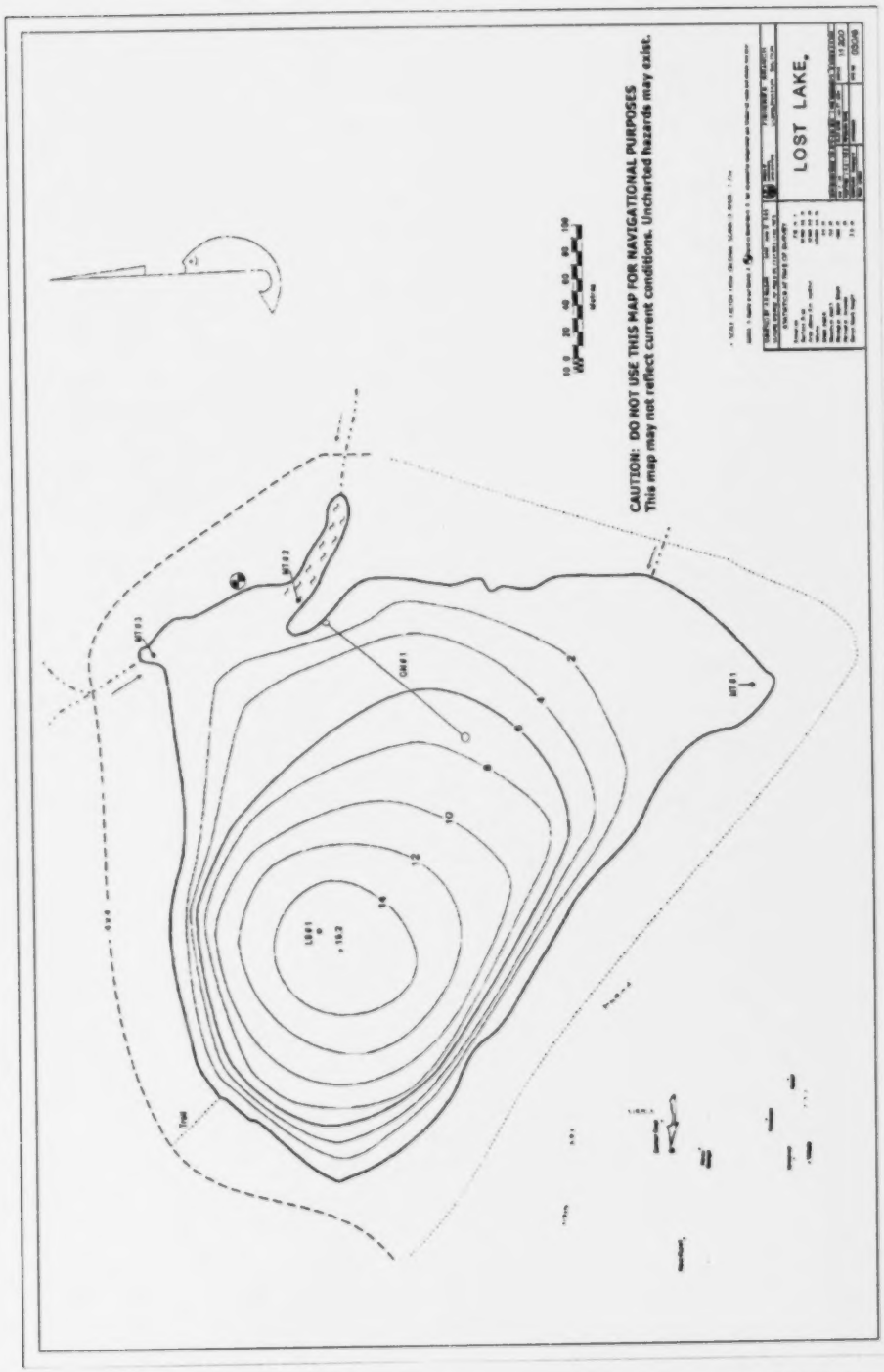

CAUTION: DO NOT USE THIS MAP FOR NAVIGATIONAL PURPOSES
This map may not reflect current conditions. Uncharted hazards may exist.
LOST LAKE,

Figure 2. Location of gill net sets and minnow trap locations on Lost Lake.

A fourth method used were small aquarium dip nets. Any small fish observed along the shoreline were captured to verify species and determine if there were any possibilities of recruitment present.

Captured brook trout were measured for fork length and weight. A biological examination was conducted on fish caught which revealed sex, maturity, stomach contents, and disease/parasite presence. Otolith samples were collected from brook trout for age determination. Fish structures were analysed by North/South Consultants (Winnipeg, Manitoba). General appearance of the fish was also determined through visual analysis. Photos of the fish were taken but are not presented in this report.

Mean lengths and weights were determined for each age class of brook trout. Condition factors ($(\text{Weight(g)} / \text{Length(cm)}^3) \times 100$) were determined for each individual fish. All other fish species were enumerated and the general appearance of these fish was observed and recorded. In addition, their minimum and maximum lengths were also recorded by species. Any fish captured that were still alive in the gill nets were released immediately.

The habitat features of Lost Lake were briefly assessed. The entire perimeter of the lake was observed to confirm presence/absence of any inlet and outlet streams. The benchmark set during the original study (1993) was located. Changes to the current water level was measured with an Abney level, 1.5 m staff, and a 30 m Eslon tape. Any new campsites and other developments identified after the original survey were also recorded. Photo documentation was also taken of the lake but is not presented in this report.

A limnology station was established to profile the water temperature and dissolved oxygen at varying depths. The deepest part of the lake was identified for this work with the aid of a bathymetric map and a depth sounder. A YSI model 58 oxygen/temperature meter was used to measure these conditions for the limnological profile. Oxygen and temperature were recorded from the surface to the bottom at 1 metre intervals. Time and weather conditions were also recorded.

RESULTS

Of the four methods used to evaluate the fish population in Lost Lake, gill netting proved to be the most effective method, producing 43 of 44 brook trout (Table 3). Angling gear produced the remaining brook trout sample. The Gee traps and dip nets produced no game fish.

Table 3. Lake catch summary for sport fish in Lost Lake, 2002.

Date	Species	Net Set #1	Angled	Total	Number Sampled	Size Range (cm)
August 4 & 5	EB	43	-	43	36	28.9 – 45.5
August 5	EB	-	1	1	1	32.4

Gill Nets

One sinking gill net set was conducted overnight on September 4, 2002 (Figure 2, Appendix 1). Gill net (GN) #1 was set for 18 hours and 45 minutes. The net was checked periodically throughout the day to avoid any high fish mortalities. No fish were caught and the net was then left to soak overnight. The net was pulled the next morning and yielded 43 brook trout. Of these fish, 7 were still alive and released immediately. Therefore, only 36 fish were sampled. No other fish species were caught in the gill net set.

Age determination for the 37 brook trout samples (including 1 angled fish) is inconsistent and can not be used to evaluate the sub-sample of fish collected in 2002. Otoliths were collected as the primary age structure. The ageing structures viewed by the consultant revealed some variances between ages (Appendix 2). Information from the ageing consultant indicated that the otoliths were of poor quality. The otoliths appeared opaque and the annuli were hard to detect. A second (experienced reader) examined the otoliths and had similar problems with them as well. Final age determination for the brook trout samples revealed that there were 3 age classes present: 2, 3, and 5 year old fish. The majority of brook trout caught were age class 2 (24 of 37). Eleven of the fish could not be aged. The final two fish comprised an age 3 fish and an age 5 fish. Based on the stocking records and the lack of spawning habitat available in Lost Lake, the only age classes deemed possible for brook trout are age 2, 4, and possibly 6 year old fish. Program staff were unable to review this data as prints of the ageing structures could not be made. With the inconsistencies in this age data, no accurate growth comparisons can be made with the brook trout samples collected in this 2002 assessment.

Plotting a length-frequency curve for these 2002 fish did present two possible cohort distributions (Figure 3). We could only see two age groups on the plot but exact ages could not be determined with any confidence. Based on the stocking records of these sterile fish and the lack of spawning habitat available in Lost Lake, there should only be three possible age classes present: 2, 4, and possibly 6 year old fish. Bin sizes were arbitrarily chosen at 3 cm intervals to categorise fish sizes. This method of age determination is generally unreliable for assigning ages to older fish as cohort distribution increasingly overlaps as fish become older. No age 6 brook trout were identified on this length-frequency curve.

Since the length at age data can not be used to determine the fishes growth for the sample of fish collected, we used condition factors to reflect the nutritional state or "well-being" of an individual fish. Condition factors were calculated (Table 4). The brook trout sampled in 2002 had a consistent condition factor around 1.30 (Figure 4A). While sample sizes of older aged fish are limited, it does appear that these fish are getting slightly larger as they mature (Figure 4B).

Table 4. Condition factors for brook trout captured in Lost Lake in 2002.

Condition Factor	2002 Survey Results
Number of fish	37
Mean C.F.	1.30
Minimum C.F.	1.00
Maximum C.F.	1.93
Standard Deviation	0.17

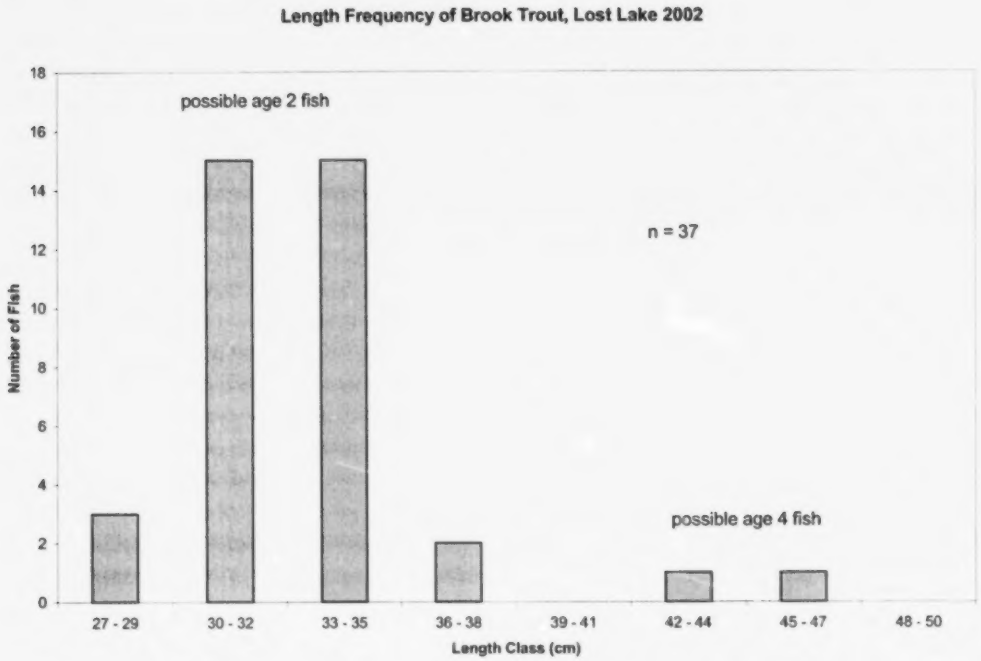


Figure 3. Length-frequency distribution of brook trout in Lost Lake, 2002.

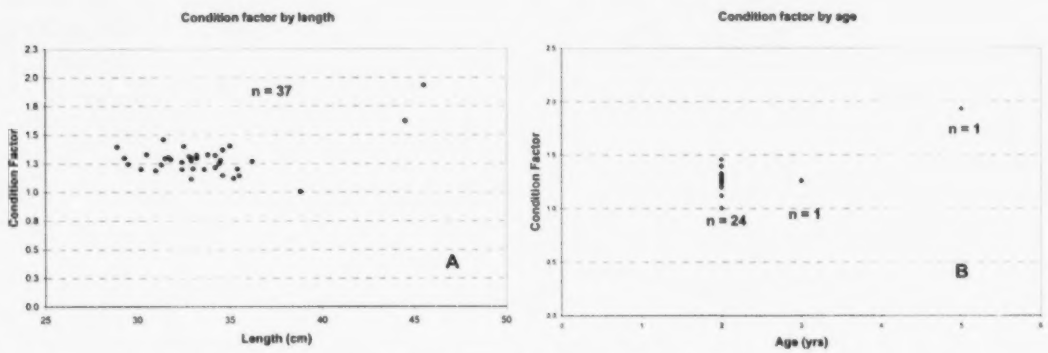


Figure 4. Condition factors of brook trout in Lost Lake, 2002.

For the 37 fish sampled, mean lengths and weights were calculated (Table 5). While the range of lengths did not vary substantially, there was a wide range of weights for these fish.

Table 5. Population characteristics of brook trout in Lost Lake, 2002.

Sample No.	Mean Length (cm)	Range of Length (cm)	SD for Length	Mean Weight (g)	Range of Weight (g)	SD for Weight
37	33.7	28.9 – 45.5	3.48	524.3	319 – 1941	297.53

Gee Traps

Three Gee traps were used in an attempt to capture juvenile fish. All three traps were baited with cat food and were set overnight (Figure 2) for a minimum of 24 hours (Table 5). No fish species were caught in the Gee traps; however, juvenile fish were noted swimming near Gee trap #3.

Table 5. Gee trap results, Lost Lake, 2002.

Trap No.	Hours Fished	Depth (m)	Substrate	Species	Number	Size Range (mm)
1	24 hrs	75 cm	Cobble + aquatic weeds	0	0	n/a
2	24 hrs 4 min	75 cm	Aquatic weeds + organics	0	0	n/a
3	24 hrs 6 min	50 cm	Small boulders + organics	0 fish 1 tadpole	0	n/a

Angling

On September 5, Program biologists angled for 1.0 hour using two rods and caught one brook trout and lost four fish. Catch per unit effort is 0.5 fish per rod hour. The brook trout was 32.4 cm long and weighed 407.0 g. Three on site anglers were also encountered and interviewed on September 4. They spent 1 hour fishing using spin cast rods and captured no fish.

Dip Netting

Juvenile fish were observed in the area of Gee trap #3 and were caught with the dip nets. The 20 fish caught were suspected of being lake chub and were preserved in formalin to allow for species identification as confirmed by Dr. Don McPhail of UBC. The approximate length of these lake chub were 20-45 mm. An additional six juvenile fish were observed but not caught.

The voucher specimens were examined by Dr. McPhail with the aid of a microscope. These immature fish were confirmed to be lake chub. During the original inventory, lake chub were not verified to be inhabiting Lost Lake. It is unknown if these fish were either missed in the original inventory or somehow were transplanted into the lake.

Limnology

An oxygen/temperature profile station was established at the determined deepest part of the lake (Figure 2). The limnology profile was completed on September 4, 2002 at 1400 hours. Weather conditions were 100% overcast with ~10 km/h breeze from the southwest. Water temperature and dissolved oxygen measurements were taken at 1.0 m intervals (Table 6). Oxygen levels for

brook trout were suitable in the upper 9 m of the water column at the time of this survey. There was a slight increase in oxygen around the 6 m depth before it lowered again. The metalimnion was located around the 6 to 7 m depth.

Table 6. Limnology Profile for Lost Lake, August 7, 2002.

Depth (m)	Oxygen (O_2)	Water Temperature (° Celsius)
Surface	9.0	15.4
1 m	9.0	15.3
2 m	8.8	15.4
3 m	8.9	15.4
4 m	8.8	15.4
5 m	8.8	15.4
6 m	10.9	14.6
7 m	11.5	11.8
8 m	10.9	9.8
9 m	6.1	8.4
10 m	0.7	7.7
11 m	0.5	7.2
12 m	0.4	6.7
13 m	0.3	6.5
14 m	bottom	bottom

BIOLOGICAL ANALYSIS OF BROOK TROUT

A biological analysis was conducted on 37 brook trout (Appendix 2). Reproductive organ analysis determined that the majority of these sterile fish were of unknown sex (31 of 37). The remaining fish were comprised of three males and three females. The male fish were either immature or mature while the female fish were of a variety of maturity levels: one appeared spent (improper egg development), one was full of viable eggs, and the last one appeared that it was mature enough to spawn in the upcoming fall. Examination of stomach contents suggest that brook trout are preying primarily on zooplankton. Other common foods included winged insects, dragonflies, and shrimp. Internal examination resulted in no visible signs of disease/parasites.

DRAINAGE

The entire perimeter of Lost Lake was examined for any inlets or an outlet. The 1993 reconnaissance survey indicated there were three intermittent inlets and no outlet present. The inlets were examined for approximately 500 m in length. None of them contained any flow at the time of the survey and possess no fisheries values. The lake was also confirmed to have no outlet.

BENCHMARK

The benchmark, located on the northeast shore, was re-located by Program biologists during the 2002 survey (Figure 2). The benchmark was originally set during the 1993 survey at an initial height of 2.0 m above the current water level in a 58 cm D.B.H. spruce tree, 3.0 m from shore (water's edge). The 2002 survey found the benchmark 3.5 m from shore in a 65 cm D.B.H. spruce tree. The spike was at 2.15 m above the current lake level, indicating a drop in the lake level of 15 cm since 1993. The benchmark was re-painted orange.

FISHERIES MANAGEMENT COMMENTS

Brook Trout

Lost Lake supports a healthy population of stocked brook trout. No fish species were caught in the 1993 survey prior to the stocking efforts. The net catch per unit effort in 2002 was 2.33 brook trout per net-hour for gill netting. Condition factors for these fish indicated robust fish. Plotting the length at age data to determine if these fish showed any signs of stunting could not be conducted with any accuracy. Although, the condition factor by age plot appears to show fish getting larger as they get older. These results suggest that Lost Lake can support at least the same number of fish without the likelihood of having stunted fish in the future.

The 1993 report published by PWFWCP biologists suggested that there may be suitable spawning substrate on the shoreline of Lost Lake. During the 2002 survey, biologists noted that some gravel/cobble substrate had been disturbed near the location of Gee trap #1. It is suspected that brook trout may have been trying to spawn in this location last fall. Two fish examined in this survey would have potentially spawned this fall, while one fish looked spent (improper egg development). No springs were observed along the shallow depths of the shoreline. It is unknown if these fish are able to successfully spawn along the shoreline substrate.

Age determination for the 37 brook trout proved to be difficult and was not very accurate. There was a lot of discrepancy in the otolith ages. Based on the stocking efforts, only age 2, 4, and possibly age 6 fish should be present. The majority of fish (24 of 37) appeared to be age 2 fish. Of these fish, their average length was 32.7 cm and their average weight was 454 g. The remainder of fish were comprised of age 3 and 5 fish. Since there is some evidence of gonads in a few fish and some possible signs of shore spawning, recruitment into the lake may be likely. This occurrence may suggest that there could be more than the age 2 brook trout present. The identified ages (3 and 5) for brook trout could then be possible, although, this recruitment is deemed unlikely (due to such a small percentage of viable fish present in the sample taken). The majority of brook trout are already sterile and the chances of them successfully spawning is presumed to be minuscule. It remains unknown what the true ages are for these 2002 fish.

Non-game fish

Lost Lake also supports a population of lake chub. These fish were not recorded during the 1993 inventory. Therefore, the 2002 observations indicate that either these fish were too small to be captured with the sampling gear used in 1993 or that these fish were illegally transplanted from a nearby lake (i.e. Morfee Lake). How these fish originated in Lost Lake remains a mystery.

Voucher samples were collected to verify proper species identification. Program staff noticed during the time of survey that non of these lake chub were of any large size. No adult size lake chub were observed swimming near the shoreline. Lake chub are very abundant in many nearby lakes and many adults have been observed along the shorelines. Further examination of these fish under a microscope revealed that the gonads of these fish were very hard to detect. This observation indicated that these fish were very immature. Ageing the fish would confirm their life stage but the otoliths were too small to obtain. Dr. McPhail indicated that these fish were probably young-of-the-year fish and that the adult lake chub must have been inhabiting another part of the lake during the time of our survey. It is suspected that the population is segregated and that these fish are not part of a stunted population. The size range of fish observed were 19 to 45 mm FL. Adult lake chub in other nearby lakes have been observed up to 97 mm FL.

MISCELLANEOUS COMMENTS

1. Photographs of Lost Lake were taken of some fish species and the surrounding habitat. Most photos were taken to document the change in features over time (i.e. habitat) and are not significant to the relevance of this report on fish stocking. Therefore, these photos are not displayed in this fish stock assessment report but can be viewed at the PWFWCP office (address indicated at the beginning of this report).

2. Angling pressure on this lake is unknown. The PWFWCP Program did conduct an aerial boat count on this lake during the summer of 2002. Results from this survey indicate that Lost Lake did not appear to receive much use during the summer. Nineteen flights were randomly flown during weekends and no anglers were observed using Lost Lake. This observation indicates that Lost Lake receives less use when compared to other lakes in the vicinity. Program biologists have had conversations from local residents from Mackenzie and there is an indication that the lake is receiving some angling pressure.

FISH STOCKING PROGRAM

The current stocking of brook trout in Lost Lake appears to be producing a suitable fishery. There appears to be no evidence of stunting as the sub-sample of brook trout taken appear to be getting larger as they get older. These triploid fish originated from Aylmer Lake, BC. According to Laird Siemens (Manager of Kootenay Trout Hatchery, Fort Steele, BC), these brook trout only have a life span of about 4 years. In order to keep stocking costs to a minimum,

the bi-annual stocking schedule should be maintained. Therefore, it is recommended to continue with the stocking regime of 2,500 brook trout every two years. Although, a slight increase in the numbers of fish is recommended for the future. In order to increase an anglers C.P.U.E., an additional 500 fish could be added to the lake. As a result, in the next (2004) stocking effort, an additional 500 fish is recommended to be added for a total stocking of 3,000 sterile brook trout.

OTHER RECOMMENDATIONS

During the next lake assessment, particular attention should be made to the lake chub population. If no larger sized fish are observed, then proper ageing structures for lake chub should be obtained to verify their ages. It could be possible that this is a stunted population present in Lost Lake and this is why they were never captured in the 1993 inventory. No lake chub were observed in the stomach contents of the brook trout. Although, with the brook trout exhibiting healthy condition factors, we suspect lake chub are being consumed by the larger sized brook trout.

LITERATURE CITED

McLean, A.R. 1993. A Reconnaissance Survey of Lost Lake. Peace/Williston Fish and Wildlife Compensation Program. Report No. 114. 20pp plus appendices.

APPENDIX 1

Netting Record

NETTING RECORD **September 5, 2002**

Mesh sizes experimental order: 25, 76, 51, 89, 38, 64 mm

NETTING SITE #1			
Type:	Sinking monofilament gill net		
Date Set:	September 4, 2002	Time:	1345 hrs
Date Lifted:	September 5, 2002	Time:	0830 hrs
Net Dimensions:	Length: 91.4 m	Depth:	2.4 m
Shallow End Mesh Size:	25 mm	Depth: Substrate:	0.5 m cobble/gravel
Deep End Mesh Size:	64 mm	Depth: Substrate:	7.0 m ?

Comments:

Gill net was set September 4 in the same location as the 1993 survey. Net was checked at 1500 hrs on September 4. No fish were caught and the net was then reset overnight. Gill net #1 was then pulled in the morning and produced a total of 43 brook trout.

APPENDIX 2

Individual Fish Data

INDIVIDUAL FISH DATA

Date Captured: September 5, 2002
Gill Net Set # 1: 18.75 hour soak

M - Male
F - Female
? - Not Obvious

IMM - Immature
MG - Maturing
MT - Mature
GV - Gravid
SP - Spent
? - Not Obvious

EG - Egg
ML - Milt
HD - Head
TG - Fish Tag
ST - Stomach

SC- scale
FR- Fin Ray
PR-pectoral ray
OT - Otolith
WF - Whole Fish

Method of Capture: sinking monofilament gillnet
Condition Factor (K) = $W / L^3 \times 100$

Species	Fork Length	Weight	Condition Factor	Gonadal Maturity	Sex	Sample Type	Stomach Contents				Comments
	(cm)	(grams)					Plankton	Insects	Fish	Other	
EB	33.8	585	1.51	MT	F	OT	ooze	? maybe leech			Potential will spawn this fall
EB	45.5	1816	1.93	?	F	OT				empty	Looks spent; improper egg dev.
EB	32.9	462	1.30	IMM	M	OT		Beetle/caddisfly		dragonfly	
EB	35.5	511	1.14	?	?	OT		Sm. beetle		detritus	
EB	32.4	428	1.26	IMM	M	OT	Zooplankton				
EB	32.9	396	1.11	?	?	OT		Winged insect			
EB	34.2	527	1.32	?	?	OT		Winged insect / shrimp			
EB	34.2	485	1.21	?	?	OT	Lots zooplankton				
EB	32.9	453	1.27	?	?	OT		Winged insect / dragonfly			
EB	44.5	1426	1.62	MT	F	OT	ooze			empty	Will spawn this yr
EB	35.2	488	1.12	?	?	OT	ooze	dragonfly			
EB	33.8	511	1.32	?	?	OT		Lots choronomid		beetles	
EB	31.5	403	1.29	?	?	OT		Dragonfly choronomid			
EB	31.3	379	1.24	?	?	OT		Dragonfly			
EB	29.5	319	1.24	?	?	OT	ooze			empty	
EB	33.2	483	1.32	?	?	OT	ooze	Shrimp Winged insect			
EB	36.2	600	1.26	?	?	OT		Very lg. beetle			Dragonfly choronomid
EB	35.4	532	1.20	?	?	OT	Zooplankton ooze				
EB	29.3	326	1.30	?	?	OT	Ooze				Well digested

INDIVIDUAL FISH DATA

Date Captured: September 5, 2002
Gill Net Set # 1: 18.75 hour soak

M - Male
F - Female
? - Not Obvious

IMM - Immature
MG - Maturing
MT - Mature
GV - Gravid
SP - Spent
? - Not Obvious

EG - Egg
ML - Milt
HD - Head
TG - Fish Tag
ST - Stomach

SC- Scale
FR - Fin Ray
PR - pectoral ray
OT - Otolith
WF -Whole Fish

Method of Capture: sinking monofilament gillnet
Condition Factor (K) = $W / L^3 \times 100$

Species	Fork Length (cm)	Weight (grams)	Condition Factor	Gonadal Maturity	Sex	Sample Type	Stomach Contents				Comments
							Plankton	Insects	Fish	Other	
EB	34.4	507	1.25	?	?	OT	ooze				Well digested
EB	31.7	414	1.30	MT	M	OT		Dragonfly/ beetle			
EB	33.0	432	1.20	?	?	OT	ooze				empty
EB	32.8	462	1.31	?	?	OT		dragonfly			
EB	34.6	566	1.37	?	?	OT		Dragonfly / sm beetle		Snails choronomid	
EB	33.6	454	1.20	?	?	OT	ooze	digested			
EB	35.0	600	1.40	?	?	OT		Lots shrimp			
EB	28.9	336	1.39	?	?	OT	zooplankton	Shrimp			
EB	31.4	451	1.46	?	?	OT		Lots shrimp			
EB	33.2	474	1.30	?	?	OT	zooplankton	Lots shrimp			
EB	32.5	480	1.40	?	?	OT		Shrimp / dragonfly nymph			
EB	34.6	474	1.14	?	?	OT		Winged insect			
EB	30.2	330	1.20	?	?	OT	Ooze	digested			
EB	30.5	376	1.33	?	?	OT					Empty
EB	34.5	523	1.27	?	?	OT					empty
EB	31.0	353	1.18	?	?	OT	Lots zoo plankton	Shrimp / choronomid			
EB	31.8	412	1.28	?	?	OT					empty
						OT					
EB	32.4	407	1.20	?	?	OT		Choronomid Dragonfly nymph			Angled

AGE DETERMINATION
BROOK TROUT OTOLITH

COMPLETED BY:
North/South Consultants - Paul Graveline
83 Scurfield Blvd.
Winnipeg, Manitoba, R3T 1G4

FISH ID	LENGTH (mm)	WEIGHT (g)	AGE	COMMENTS
1	338	585	2	Poor
2	455	1816	5	Poor
3	329	462	2	
4	355	511		Unageable
5	324	428	3	
6	329	396		Unageable
7	342	527	2	Poor
8	342	485	2	
9	329	453	2	
10	445	1426		Unageable
11	352	488	2	
12	338	511		Unageable
13	315	403	2	Poor
14	313	379	2	
15	295	319	2	
16	332	483		Unageable
17	362	600	2	Poor
18	354	532	2	Poor
19	293	326	2	
20	344	507	2	
21	317	414	2	Poor
22	330	432		Unageable
23	328	462	2	Poor
24	346	566		Unageable
25	336	454	2	Poor
26	350	600	2	
27	289	336	2	Poor
28	314	451	2	Poor
29	332	474	2	
30	325	480		Unageable
31	346	474		Unageable
32	302	330	2	Poor
33	305	376	2	
34	345	523	2	
35	310	353		Unageable
36	318	412		Unageable
37	324	407	2	Poor